

Claims

1. A thermoplastic vulcanizate comprising four components (A, B, C, D), specifically:

- a thermoplastic (A);
- a substantially non-cross-linked polyethylene (B);
- an at least partially vulcanized rubber (C); and
- a plasticizer (D);

as well as, furthermore, the standard blend ingredients (E), whereby the mixture contains from 5 to 20% by weight thermoplastic synthetic resin (A), notably based on the sum of the four components (A, B, C, D).

2. The thermoplastic vulcanizate according to claim 1, characterized in that the mixture comprises the following quantitative proportions with respect to the four components (A, B, C, D):

Thermoplastic synthetic resin (A)	5 to 20% by wt.
Polyethylene (B)	25 to 5% by wt.
Rubber (C)	30 to 50% by wt.
Plasticizer (D)	40 to 25% by wt.

3. The thermoplastic vulcanizate according to claim 1, characterized in that the mixture comprises the following

quantitative proportions with respect to the four components (A, B, C, D):

Thermoplastic synthetic resin (A)	5 to 20% by wt.
Polyethylene (B)	15 to 5% by wt.
Rubber (C)	30 to 50% by wt.
Plasticizer (D)	50 to 25% by wt.

4. The thermoplastic vulcanizate according to any one of claims 1 to 3, characterized in that the standard ingredients (E) of the blend are added in from 0.02 to 0.5 times the amount by weight based on the sum of the four components (A, B, C, D).

5. The thermoplastic vulcanizate according to any one of claims 1 to 4, characterized in that the thermoplastic synthetic resin (A) is a polypropylene based on a homopolymer, block polymer or copolymer preferably in conjunction with high crystallinity.

6. The thermoplastic vulcanizate according to any one of claims 1 to 5, characterized in that the polyethylene (B) is a VLDPE with a density of from 0.88 to 0.91 g/cm³ at 20°C and/or a ULDPE with a density of from 0.85 to 0.88 g/cm³ at 20°C.

7. The thermoplastic vulcanizate according to any one of claims 1 to 6, characterized in that the rubber (C) is an EPDM

rubber, whereby the third monomer is preferably an ethylidene-norbornene.

8. The thermoplastic vulcanizate according to any one of claims 1 to 7, characterized in that the rubber (C) has a degree of cross-linking of $> 90\%$, preferably $> 95\%$.

9. The thermoplastic vulcanizate according to any one of claims 1 to 8, characterized in that the plasticizer (D) is a plasticizer oil, in particular a paraffinic oil with a component of aromatics of $< 4\%$ by weight, preferably a paraffinic plasticizer oil free of aromatics.

10. A method for producing a thermoplastic vulcanizate according to any one of claims 1 to 9, characterized in that the rubber (C) in the still-unvulcanized state is first mixed with a plasticizer (D) and the standard blend ingredients (E) in a roll or screw extruder, whereby the standard blend ingredients preferably still not yet contain a cross-linking agent or cross-linking system.

11. The method for producing a thermoplastic vulcanizate according to claim 10, characterized by the following process steps:

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- feeding of the unvulcanized rubber (C) and the standard blend ingredients (E);
 - meltdown and dispersion of the rubber (C) as well as of the standard blend ingredients (E); and
 - addition of the plasticizer (D) while mixing with the two charged components (C, E).

12. The method for producing a thermoplastic vulcanizate according to claim 10 or 11, characterized in that the plasticizer (D) and the standard blend ingredients (E) are admixed into the unvulcanized rubber (C) in the first third part of the roll or screw extruder.

13. The method for producing a thermoplastic vulcanizate according to any one of claims 10 to 12, characterized in that mixture comprised of the thermoplastic synthetic resin (A), and the non-cross-linked polyethylene (B) is added downstream of the first third part of the roll or screw extruder.

14. The method for producing a thermoplastic vulcanizate according to any one of claims 1 to 9, characterized in that in a roll or screw extruder, the rubber (C) in the still-unvulcanized state is substantially simultaneously mixed with the thermoplastic synthetic resin (A), the non-cross-linked polyethylene (B), the plasticizer (D) and the standard blend

ingredients (E), whereby the standard blend ingredients preferably not yet contain a cross-linking agent or cross-linking system.

15. The method for producing a thermoplastic vulcanizate according to claim 14, characterized in that the thermoplastic synthetic resin (A), the non-cross-linked polyethylene (B), the plasticizer (D) and the standard blend ingredients (E) are admixed into the unvulcanized rubber (C) in the first third part of the roll or screw extruder.

16. The method for producing a thermoplastic vulcanizate according to any one of claims 10 to 15, characterized in that a non-cross-linked rubber (C) is used, said rubber being present in a flowable state, preferably in the form of a flowable pellet or granulate.

17. The method for producing a thermoplastic vulcanizate according to any one of claims 10 to 16, characterized in that following mixing of the four components (A, B, C, D) and the standard blend ingredients (E) without the cross-linking agent or cross-linking system, the cross-linking agent or the cross-linking system is now added in conjunction with the following steps of the process:

- Dynamic vulcanization of the rubber (C) at high shear and expansion rates;
- degassing of the dynamically vulcanized plastic melt, in particular under vacuum; and
- building up the pressure for ejecting the thermoplastic vulcanizate from the mold.

18. The method for producing a thermoplastic vulcanizate according to claim 17, characterized in that all steps of the method connected with the addition of the cross-linking agent or cross-linking system are carried out in the second half of the roll or screw extruder.

19. The method for producing a thermoplastic vulcanizate according to any one of claims 10 to 18, in particular in association with claim 17 or 18, characterized in that a cross-linking agent or cross-linking system is used that cross-links the rubber (C) on the one hand, and prevents the polyethylene (B) from cross-linking on the other, preferably based on a phenolic resin, in particular again in connection with an accelerator consisting of tin dichloride.

20. The method for producing a thermoplastic vulcanizate according to any one of claims 10 to 19, characterized in that the preparation of the mixture comprised of the four components

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$\frac{d}{dt} \left(\frac{\partial L}{\partial \dot{x}} \right) = \frac{\partial L}{\partial x}$

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